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ABSTRACT

This study determined if instruction in nonverbal communication would improve teacher competency and student achievement in an elementary education setting. Subjects consisted of teachers and fifth grade students randomly assigned to experimental and control groups. Those in the experimental groups were instructed in nonverbal communication. All groups were tested to determine if the instruction in nonverbal communication produced differential effects. None of the hypotheses advanced were statistically confirmed. Since the hypotheses were firmly grounded in a theoretical perspective, it seemed premature to reject the theoretical base. Consequently, attention was focused on the experimental procedure, and it was determined that there were some areas that could be strengthened. The primary recommendations were that: 1) naive teacher subject be utilized, 2) training sessions in nonverbal communication for teacher and student subjects be extended over a longer period of time, and 3) teacher-student interaction be extended to include several one-hour sessions. (Author)

Final Report

Project No. 1-J-016
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THE EFFECTS OF INSTRUCTION IN NONVERBAL COMMUNICATION ON ELEMENTARY SCHOOL TEACHER COMPETENCY AND STUDENT ACHIEVEMENT

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Pullman, Washington

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ABSTRACT

Purpose: The purpose of this study was to determine if instruction in nonverbal communication would improve teacher competency and student achievement in an elementary education setting.

Procedure: Subjects consisted of teachers and fifth grade students randomly assigned to experimental and control groups. Those in the experimental groups were instructed in nonverbal communication. All groups were tested to determine if the instruction in nonverbal communication produced differential effects.

Findings: None of the hypotheses advanced were statistically confirmed.

Conclusions: Since the hypotheses were firmly grounded in a solid theoretical perspective, it seemed premature to reject the theoretical base. Consequently, attention was focused on the experimental procedure and it was determined that there were some areas that could be strengthened. The primary recommendations were that: (1) naive teacher subjects be utilized; (2) training sessions in nonverbal communication for teacher and student subjects be extended over a longer period of time; (3) teacher-student interaction be extended to include several one-hour sessions.

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PREFACE

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Finally, we are indebted to the American Association for the Advancement of Science/Xerox Company for use of the subject matter material.

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Introduction

Statement of the Problem. The basic function of human communication has been traditionally to arrive at shared meaning through the use of verbal and nonverbal codes. Historically, numerous elaborate structures were established for the verbal code and ultimately used to facilitate instruction in letter-writing, prose composition of all types, spelling, and grammar. In fact, the presumption that the verbal code alone carried the essential elements necessary for effective sharing of meaning appears to underlie most of these models of communication.

Certainly those involved in controlling educational settings have emphasized verbal codes to the neglect of the nonverbal (see Flanders, 1960; Simon and Boyer, 1965; and Amidon and Hough, 1967) for one highly plausible reason--"Verbal language is the most easily isolated input into a communication system. The words and grammatical structures are identifiable as written or oral symbols with definable limits of meaning" (Clark, Erway, and Beltzer, 1971, p. 52). The emphasis and frequency given to the verbal systems have led Barnlund (1968, p. 511) to conclude that it is "tempting to believe verbal signs are the only means, or at least the principal ones, by which men express their ideas and feelings. Everyday experiences, on the other hand, amply refute this conclusion. Differences of time and place, changes in dress, coiffure, posture, or facial expression modify and sometimes totally override the literal meaning of a message".

In recent years Barnlund and other scholars have begun to discover the impact the nonverbal code has on communication, generally. Many of the nonverbal components have now been identified and described, their effects on communication reported, and extensive notational systems have been advanced for their classification (see Birdwhistle, 1955; Altman, Clark, and Lett, 1969; Thompson, 1967; Ruesch and Kees, 1956; and Hall, 1959). In light of these recent developments, the reasons for emphasizing training in the verbal code to the relative neglect of the nonverbal are no longer defensible. Shared meaning in its truest sense cannot emerge in the classroom setting without a clear nonverbal communication channel. Current literature indicates that in order to become an effective communicator one should develop the ability to react appropriately to nonverbal feedback (Gray and Wise, 1959). Studies conducted on this aspect of feedback demonstrate that communicators have not refined this ability (see Jecker, Maccoby, Breitrose, and Rose, 1964; Faules, 1963; and Dickens and Krueger, 1969).

Purpose. The purpose of this project is to construct and test

two pilot instructional units in nonverbal communication[1] and determine their effectiveness upon teacher competency and student achievement in elementary education. One of these units will be directed toward assisting teachers to decode nonverbal cues from students and the other directed toward assisting students in encoding nonverbal cues.

Definitions. Terms basic to understanding the hypotheses and procedures used in this study are defined as follows:

Teacher competency was operationally defined as the teacher's prediction of student achievement on a subject matter unit test.

Student achievement was operationally defined as the score the student received on the subject matter unit test.

Trained teachers were those who received instruction in decoding nonverbal cues.

Untrained teachers were those who did not receive instruction in decoding nonverbal cues.

Trained students were those who received instruction in encoding nonverbal cues.

Untrained students were those who received no instruction in encoding nonverbal cues.

Hypotheses. The following hypotheses were advanced for this specific study:

(1) Achievement of trained students would be more competently judged by trained teachers than by untrained teachers.

(2) Achievement of untrained students would be more competently judged by trained teachers than by untrained teachers.

(3) Trained students achievement would be more competently judged by both trained and untrained teachers than will the achievement of untrained students.

(4) Trained teachers would be more competent in judging both

---

[1] Nonverbal communication is presumed to refer to "any movement or position of the face and/or the body" (see Ekman and Friesen, 1969, p. 49), as well as one's use of space (both personal and territorial).

trained and untrained student achievement than will untrained teachers.

(5) Trained students would exhibit a higher degree of achievement than untrained students.

Procedures

The investigation was conducted in the following developmental sequence:

Instructional units. Two specific instructional units were compiled approximating the paradigm of DeCecco (1968). The instructional unit for teachers utilized examples and illustrations relating to decoding behavior. The instructional unit for students utilized material relating to encoding behavior (see Appendix A). The teachers selected to receive training met as a group. The students selected to receive training also met as a group.

Subject selection. Elementary school science teachers attending a science workshop[2] at Washington State University, during summer session 1971, served as subjects. Specifically, ten of these teachers were randomly selected from the thirty-eight teachers attending the workshop. Five of the selected teachers were randomly assigned to a group which received training in nonverbal communication and five to a group which did not receive training.

Forty students were selected randomly from a list of fifth grade students in the Pullman Public schools to serve as subjects. Twenty of the selected students were randomly assigned to a group which received training in nonverbal communication and twenty were randomly assigned to a group which did not receive such training.

Subject matter. The instructional unit which was chosen to be utilized as the subject matter for the research project was Part D, Science--A Process Approach, Inferring Number 3--Observations and Inferences (see Appendix B). The behavioral objectives of this unit were:

At the end of the exercise each child should be able to:

1. Distinguish between observations and inferences in situations featured in cartoons.

2. Construct one or more inferences from an observation or a set of observations in one or more cartoon.

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[2]The workshop was funded by the Cooperative College School Science Program (Project No. GW 6453).

The Science--A Process Approach curriculum is organized into specific parts, each of which coincides for approximately one school year. Part D was selected for the student participants since it would be normally taught in either the third or the fourth grade depending upon placement. Since none of the student-subject participants had been familiar with any of the prerequisite entry behaviors it was professionally decided that it would be best to use a curriculum component which would be approximately one year earlier for the students to avoid frustrations due to learning difficulty.

To answer the question, "Is the Science--A Process Approach testing or evaluation component valid or reliable?" We utilized the source "An Evaluation Model and Its Application: Second Report," edited by Henry H. Walbesser, Jr., Washington, D.C., Commission on Science Education, American Association for the Advancement of Science, 1968, AAAS Miscellaneous Publication 68-4. In this and previous evaluation monographs Walbesser established criterion measures for each specific set of performance objectives for each exercise in the AAAS program. Thus, extensive field testing took place during the years 1964 through 1966 concerning the AAAS science program. Competency measures for the exercise Inferring Three, Observations and Inferences, were made during 1964 and 1965. During 1964, approximately 81% of all the children that were tested acquired 90% of specified behaviors which were called for in Inferring Three.

Measures. After the teacher had presented the science unit to the student, the teacher was asked to estimate what score that each student would receive on a test over the material presented. The student took the test immediately following the end of the teacher's presentation. The student's score on the examination was subtracted from the teacher's estimate. The difference score obtained through this procedure was one criterion measure used in this study. The other criterion measure was the student's raw score on the test given over the subject matter unit (see Appendix C).

Design. This study employed a two factor design with repeated measures on one factor on the difference score criterion measure. The design consists of two dimensions (students and instructors) each containing two levels (trained and untrained). Perhaps, the following diagram will enable the reader to more easily conceptualize this design:

FACTORS	LEVELS			
Teachers (Repeated)	Trained		Untrained	
Students	Trained	Untrained	Trained	Untrained

In essence this meant that there were two groups of teachers and two groups of students, one group of teachers and one group of students would receive nonverbal communication training and the other two groups would not. The design allows one to consider the differential effects of training.

The two variable independent and dependent measure design used the students' raw test score as the criterion. Untrained students' achievement scores were compared with trained students' scores.

Statistical analysis. A two way analysis of variance for fixed effects was used for testing hypotheses one through four. A t test was employed to test hypothesis five.

Results

Table one summarizes the results of the two-way analysis of variance with repeated measures on one factor (for the specific statistical procedure see Winer, 1962, pp. 302-318) employed to analyze data relevant to four of the five major hypotheses in this study.

Table I

Two-Way Analysis of Variance Relevant to Predictive Ability

Source Variation	SS	df	MS	F
Between Subjects	44.9166	23		
A	2.0832	1	2.080	1.0666
Subjects within Groups	42.8334	22	1.946	
Within Subjects	29.0000	24		
B	0.0000	1	0.000	0.0000
AB	3.0000	1	3.000	2.5420
BX Subjects within Groups	26.0000	22	1.181	

Hypothesis One: Achievement of trained students will be more competently judged by trained teachers than by untrained teachers.

The obtained interaction F value of 2.542 relevant to this hypothesis failed to reach the required value (F .5, 1 and 22 df = 4.3) for statistical significance. Therefore, it was concluded that the hypothesis that the achievement of trained students would be more competently judged by trained teachers than untrained teachers could not be confirmed.

Hypothesis Two: Achievement of untrained students will be more competently judged by trained teachers than by untrained teachers.

The obtained interaction F value of 2.54 with 1 and 22 df failed to reach the required value of 4.3. Therefore, it was concluded that

hypothesis two could not be confirmed.

Hypothesis Three: Trained students achievement will be more competently judged by both trained and untrained teachers than will the achievement of untrained students.

The obtained within variance value of 0 with 1 and 22 df relevant to this comparison failed to reach the required value of 4.3. Therefore, it was concluded that hypothesis three could not be confirmed.

Hypothesis Four: Trained teachers will be more competent in judging both trained and untrained student achievement than will untrained teachers.

The obtained between variance value of 1.066 with 1 and 22 df failed to reach the required value of 4.3. Therefore, it was concluded that hypothesis four could not be confirmed.

Hypothesis Five: Trained students will exhibit a higher degree of achievement than untrained students.

The two sample $\underline{t}$ test applied to the data relevant to hypothesis five produced a value of .74 which failed to exceed the required value (t .05, 38 df = 2.021) for statistical significance. Therefore, it was concluded that hypothesis five could not be confirmed.

Conclusions

Unfortunately none of the hypotheses set forth in this investigation were confirmed. The question of concern now is why none of these propositions were proven. One could view the lack of significance in this study as meaning that the nonverbal code is relatively unimportant and cannot be systematized and taught.

Since all of the hypotheses were firmly grounded in a solid theoretical perspective, however, there seems to be another explanation that is perhaps more reasonable. This explanation evolves around a systematic bias in the research procedure. Science teachers with similar backgrounds were utilized for both the experimental and control groups. These teachers were acquainted with the "process approach curriculum" and seemed ideally suited for this study because it was believed they would be able to concentrate more on students' nonverbal behavior and not have to focus as much attention on their own personal competence in conveying subject matter. We thought this familiarity with the units would favorably effect the investigation and enhance the possibility of confirming the research hypotheses. As it turns out, however, all the teachers were aware that students typically got 90% of the criterion referenced questions accompanying this unit correct. It is, therefore, quite likely the teachers' judgments of student competency were based not on the nonverbal cues they were receiving but on previous experience with students' performances. The teachers almost universally indicated that the students would get the questions correct. Our present hypothesis is that they would have indicated the same level of competence whether they had taught the students or not.

Of course, teachers' predictions of a high level of student achievement coupled with a high level of student achievement resulted in a small amount of variance. The variability was of such low magnitude that no statistically significant difference occurred across any of the experimental conditions. Consequently, any future study should utilize teachers who are naive in relation to the particulars of the unit to be used.

Some other plausible rival hypotheses include the possibility that the instructional units in nonverbal communication were too short to be effective--that longer training sessions may be desirable to modify behaviors reinforced throughout a lifetime. It could be, also, that teachers and students need to interact longer than an hour for the effect of instruction in nonverbal communication to emerge.

In summary, therefore, we recommend:

1. That naive teacher subjects be utilized in a follow-up experiment.

2. That training sessions for teacher and student subjects be extended over a longer period of time.

3. That teacher student interaction be extended to include several one hour sessions.

4. That the basic procedure be retained.

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Appendix A

Instructional Units in Nonverbal Communication for Students and Teachers

Nonverbal Communication Teaching Unit For Students

I. Overall Goals

A. To learn to express reactions more freely
B. To learn to express reactions more accurately
C. To learn to recognize how others use nonverbal behavior to communicate

II. General Organizational Format - This unit is designed to be completed in two hours. It is structured so that it can be presented in four half hour subsets. Nonverbal communication aspects of space, facial expression, territorality, and body language comprise the four sections.

III. Specific step by step procedure with attenuate subgoals and instructional materials.

A. Introduction

1. Goal: To gain and focus attention on nonverbal communication
2. Procedure
   a. Short discussion of the main focus of learning experiences in school to this point (i.e. learning formal symbol systems). This discussion should lead to the question of whether there is another way to communicate with people other than by writing or speaking.
   b. Use overhead projection #1 (see Campbell and Nepler, 1970, p. 258).
   c. Discuss nonverbal elements in projection #1
      (1) Ask if both people have reached the same understanding?
         (a) Hands
         (b) Face
         (c) Point out these are important elements that will be talked about more later
3. Is this an important agreement? Do you think the agreement has to do with buying a car or some such?
   (a) Point out the distance factor and lead into the space section

B. Space

1. Goals: Get student personally involved. Help students understand how space effects communication
2. Procedure
   a. Teacher should move in close to one of the students

and begin talking about the student's reaction--try to get the student to verbalize his reaction. Talk about the way in which people violate such space or don't--like the way a teacher towers over a student or a bully over the kid he's bullying.

b. Have a couple of students position themselves in sitting and standing positions and talk about what the changes do to the way a situation is viewed.
c. Have students try moving toward one another in pairs and stopping when they are at a comfortable distance. Talk about how this effects the school situation (i.e. by observing how far away others are standing one can often be able to tell whether this is going to be a formal discussion, conversational, etc.).
d. Point out eye contact behavior (why didn't you gaze directly into the other person's eyes when you walked toward them?) and use this as a lead into the facial expression section.

C. Facial

1. Goal: To gain an understanding of the impact of facial elements of message meaning.
2. What occurs when you stare at someone else? Let's try it (have students form two lines about two feet apart and look directly at the person opposite, then take 1 step to the side and look directly at the next person and so on). Discuss the effect of eye movement and eye contact on the interpretation of meaning.
3. Of course one hardly ever looks only at another's eyes. I wonder if ones total face can express meanings. Let's see if we can use only facial expression to get across meaning. Have students try encoding happiness, fear, anger, love, hate, friendliness, sadness, courage, greed, envy, indifference. Write terms on cards and have each student take a card and then each student in turn is to try to express the feeling on the card facially and all other students are to try to guess the emotion being expressed (be sure to tell the students that the same feeling may appear on more than one card and therefore if two people seem to be expressing the same feeling they may well be).

Wrap up first two units by pointing out the effects of space and facial expression on meaning (communication). Give the students a fifteen minute break.

D. Territory

1. Goal: to point out the effects of territory on communication

2. Begin by asking those students who returned to the seat they occupied the previous hour why they chose to sit in the same place again. Ask Ss why it bothers them to be moved once they have a seat somewhere.
3. Ask students why they are sent to the principal's office rather than having the principal sent to see them.
4. Do you talk to the principal differently in his office than if you see him out playing ball with his children? Why?
5. Point out the importance of place on communication--it's important to recognize where you are before talking.
6. The way a person is standing is also important in determining whether you should approach them. Use as a lead in to the body section.

E. Body

1. Goal: To gain an experiental and cognitive understanding of the role of bodily movement in communication.
2. Have students try to encode the same emotions using only their bodies as they did their hands. Follow the same procedure. Remember to bring some masks for this exercise. Discuss how each person tried to get the job done.
3. Point out there are some other interesting ways people use their bodies in communicating. Point out the way sit or stand together that can tell someone else if they can join the conversation or sit at that particular table.

F. Summary

1. Goals: To touch on the main points covered in the previous sections, to see if students can identify major elements in nonverbal communication situation.
2. Present students with a series of pictures and ask them to identify major nonverbal communication elements (see attached pictures).

Sources (Refer to bibliography page for complete citation):

Hall (1959)
Hall (1966)
Ardrey (1966)
Sommer (1969)
Fast (1970)
Campbell and Hepler (1970)
Pfeiffer and Jones (1970)

Nonverbal Communication Teaching Unit for Teachers

I. Overall Goals

A. To stress the importance of nonverbal communication
B. To stress the importance of encouraging free reaction of students
C. To learn to read free reactions accurately
D. To learn to express nonverbal cues accurately
E. To encourage teacher participation through free discussion of the unit

II. This unit is designed to be completed in two hours. It is structured so that it can be presented in two one hour segments.

III. Specific step by step procedure with subgoals and instructional materials.

A. Introduction

1. Goal: To stress the importance of nonverbal communication by:
a. Citing conclusions contained in scholarly literature.
(1) All messages are accompanied by meta-messages (nonverbal cues). These meta-messages serve to qualify verbal messages. It is impossible not to meta-communicate. (Ruesch and Bateson)
(a) Only seven percent is verbal; 30 percent vocal; remainder nonverbal
(2) Two problem arise when we study closely communication:
(a) When the meta-message is contradictory to the verbal message and,
(b) When the meta-message is not interpreted by the receiver.
(3) Neither of these problems have been solved because no organized attempt has yet been made to resolve them.
(4) In interpersonal relationships, the initial impression is a lasting one if the only impression, if not,
(5) The more interpersonally involved two people become, the greater admiration one has for the other and vice versa.
(6) We tend to communicate more about ourselves than we intend to.
(7) Human behavior evolves around interaction, sentiment, and activity.

b. Encourage discussion of those principles to include personal instances of where and when these occur.
c. We must now take two problems in communication and seek to correct them so that:
   (1) The meta-message is consistent with the verbal message (accuracy), and
   (2) The meta-message is interpreted by the receiver

B. Space

1. Goals: Acquaint teacher with the importance of space
   a. We all maintain a spatial barrier as a part of our defense mechanism. If that space is invaded we will act aggressively or defensively:
      (1) If aggressive, we will attempt to get the intruder out of the space
      (2) If defensive, we will try to please
   b. Spatial consideration may apply to the proximity of one's desk, standing position, sitting position, etc.

C. Facial

1. Goals: To gain an understanding of the impact of facial elements of message meaning
   a. We probably look first at a person's facial expressions, e.g., mouth, eyes, forehead, etc., then other parts of the body. These expressions will register love, hate, etc. Hopefully they will also register reaction to subject matter, e.g., "I understand," "I do not understand," "I do not agree," etc.
   b. Often the eyes will convey receptivity.
   c. For confirmation or clarification of the message, ask questions.

D. Territory

1. Goal: To point out the effects of territory on communication
   a. We all have certain physical areas that we intentionally or unintentionally believe is a part of our domain. We have a desk in the classroom which is ours. We probably consider most areas or objects in a classroom to belong to us.
   b. We become wary if any of those areas are invaded and
   c. We may react aggressively or defensively.
   d. Students may feel the same way about their desk. Thus, if the teacher believes their desk to be his desk, a conflict may arise.

e. Teacher, respect the territory of your students.
f. Be cautious in your communication--act more as a guest when you are in their territory. Be receptive to his communication.
g. Perhaps if you labled things as mine, yours, ours, you could help set the ground rules for communication.

E. Body

1. Goal: To gain an understanding of the role of bodily movement in communication.
   a. Body movement may take several forms. It may consist of posture, gesture, etc.
   b. As a general rule posture will reflect moods and attitudes while facial expression is mostly a momentary experience. (Reusch and Kees)
   c. You seek to interpret body attitudes as an index to an emotional state and a mental frame.

F. On the basis of these four items, seek to facilitate your teaching by:
   a. Expressing yourself honestly and accurately
   b. Encouraging them to do the same.
   c. When in doubt about their reactions, ask.
   d. Avoid violating their sense of space and territory
   e. Seek to modify their behaviors without being unduly authoritative.

Sources (See Nonverbal Communication Teaching Unit for Students.)

Appendix B

Subject Matter Used in Experiment

SUBJECT MATTER USED IN EXPERIMENT

SCIENCE--A PROCESS APPROACH/PART D

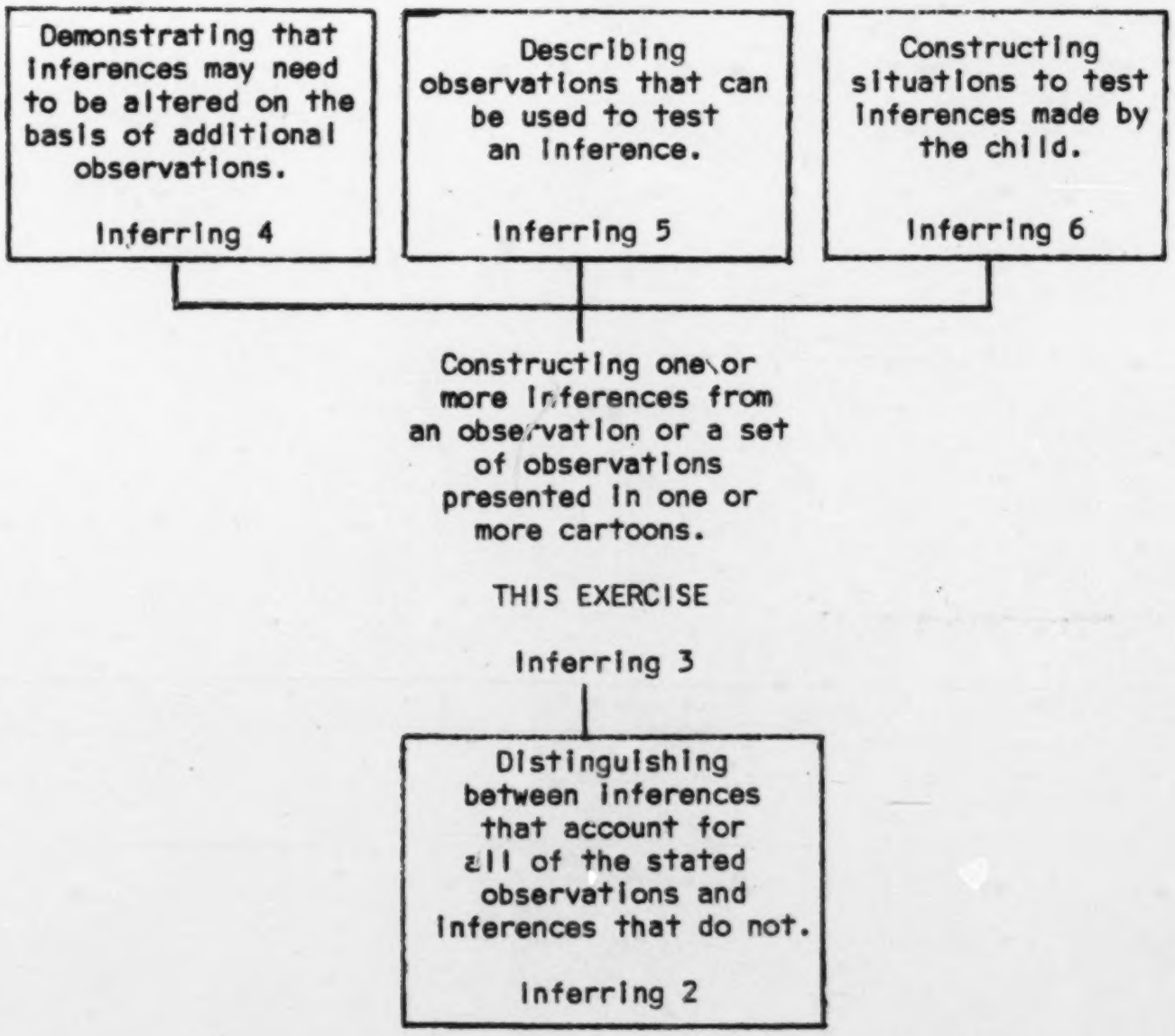
INFERRING 3
OBSERVATIONS AND INFERENCES

OBJECTIVES
At the end of this exercise the child should be able to

1. DISTINGUISH between observations and inferences in situations pictured in cartoons.

2. CONSTRUCT one or more inferences from an observation or a set of observations presented in one or more cartoons.

SEQUENCE


Demonstrating that inferences may need to be altered on the basis of additional observations.
Inferring 4
Describing observations that can be used to test an inference.
Inferring 5
Constructing situations to test inferences made by the child.
Inferring 6
Constructing one or more inferences from an observation or a set of observations presented in one or more cartoons.
THIS EXERCISE
Inferring 3
Distinguishing between inferences that account for all of the stated observations and inferences that do not.
Inferring 2

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RATIONALE

In two earlier exercises--Inferring the Characteristics of Packaged Articles and Differentiating Between Similar Things, Inferring 1 and 2, Exercises I and n, Part C--the child began to distinguish between his observations (what he sees, smells, hears, touches, and tastes) and his inferences (what he thinks is responsible for what he has observed, or how he explains his observations). Now the child will continue to make these distinctions by identifying statements that others make as observations or inferences, and he will construct inferences by imagining himself in given situations. In subsequent exercises, he will develop skill in testing and revising his inferences.

Learning to make careful and valid inferences in scientific work requires a critical attitude toward one's own inferences as well as those of others. From now on, you should try to develop this critical attitude by reinforcing the conscious distinction between an inference and an observation as the situations arise. Ask questions such as these: Is that an observation? Did you actually see a dog run away with your ball? Or is that an inference? In other words, is that what you think may have happened?

In the activities that follow, the child is to assume that the cartoons represent situations in which the cartoon characters make observations and inferences. Of course, the child has no more information in each situation than what he learns from the observations stated by the boys in the cartoon. On this limited information, he first classifies the boys' statements as observations or inferences and then critically examines the basis for each inference. Finally, in Activity 4, he imagines himself as one of the characters in the situations and constructs inferences on the basis of the observations given.

VOCABULARY

observation
senses

inference
to infer

RELATED MATERIALS

Listed below are the materials required to conduct this exercise.

Some items cannot be supplied at all or are not supplied by Xerox in the Standard Kit. These are designated as NS. Note, however, that many items so designated are supplied in the Comprehensive Kit. A separate list of these items is included with the comprehensive materials.

It should be noted that some supplied items are expended in the course of this exercise. These expendable items are designated as EXP.

Cartoons 1-6, 30 copies of each (EXP)

Question sheets for Cartoons 1-6, 30 copies of each (EXP)

Cartoons 7 and 8, 30 copies of each (EXP)

INSTRUCTIONAL PROCEDURE

Introduction

Present one or two familiar situations in which the children can readily point out the observations and inferences. For example:

You see boys and girls wearing raincoats today (observation); it must be a rainy day (inference).

The kitchen stove is warm (observation); the smell of apples cooking is coming from the stove (observation). Apples are baking (inference).

The doorbell is ringing (observation); company is here (inference).

Discuss the differences between these observations and the inferences drawn from them. What senses did you use to make the observations? Then build up more complicated situations. For example: Mother looks out the kitchen window and sees Jimmy hurrying toward the house with tears on his face. He is holding one knee with his hand as he hops along. She sees his upset tricycle on the sidewalk. She is making two observations: an unhappy-looking little boy protecting a knee, and an upset tricycle. Those observations are all visual. What is her inference? (Jimmy has fallen off his tricycle, and skinned his knee.) To determine whether his knee is skinned or only bruised will require more observations.

Encourage the children to give examples of similar situations from their own experiences. To help them overcome some of the difficulty in distinguishing between observations and inferences, always point out that whenever someone makes an observation, he should also be able to name the senses he used--sight, smell, touch, hearing, or taste. Review these senses in some detail if necessary.

ACTIVITY

Give each child a set of cartoons (see Figures 1-6) and ask the children to look at Cartoon 1. Tell them about the two boys: Andrew, the taller boy, is seven years old. He naturally thinks he knows much more than Mike, who is only five years old. Mike always has his own opinion, however, and he puts up an argument.

Tell the children to read the cartoon story to find out why Andrew and Mike are arguing. After they have read the story, begin a discussion of the frames by asking questions that will help the children recognize the written observations and inferences. Here are some examples:

What was the disagreement about? (How the bike got wet. Andrew said that it must have rained. Mike said that maybe his mother had watered the lawn.)

Why did Andrew infer that it had rained? (He observed that the ground and the tricycle were wet.)

Did Andrew see the rain? (No.)

Why did Mike infer that Mother had watered the lawn? (From the same observation--that the ground was wet.)

Did Mike see his mother water the lawn? (No.)

What made Andrew think that it had rained? (He knows from past experience that rain makes the ground wet.)

Could Mike be right when he says that his mother watered the lawn? (Yes.)

How many children think that Andrew is right?

Why?

How many think that both are right?

Why?

Can we decide which boy is right? (No.)

Why not?

Should we make further observations? (Yes.) Why? (We do not have enough information yet.)

After some class discussion, have the children complete their copies of the question sheet given below:

QUESTIONS FOR CARTOON 1

Which of the following statements are observations? Which are inferences? Circle 0 if you think the statement is an <u>observation; circle</u> 1 if you think it is an inference.

The ground is wet.	0	1
The tricycle has water drops on it.	0	1
It rained while we were sleeping.	0	1
Mother watered the lawn.	0	1

Which senses did Andrew and Mike use to make the observations? (Sight.)

What would you do to find out which boy is right in the inference he made? (Try to get more information. For example, we might examine the yard next door, or see if the hose is wet, or ask Mother.)

(NOTE: The suggestions in parentheses here and the answers circled above are for you and are not on the question sheet.)

ACTIVITY 2

Use Cartoon 2 in the same way, discussing each frame as you did in Activity 1. After the discussion, have the children complete their next question sheet.

QUESTIONS FOR CARTOON 2

Which statements are observations? Which are inferences? Circle 0 if you think the statement is an observation; circle 1 if you think the statement is an inference.

The tricycle felt wet.	0	1
Now it is dry.	0	1
The water evaporated. It went into the air.	0	1
Mother dried the tricycle.	0	1

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

ACTIVITY 3

To add variety, you may want to have the children stage Cartoons 3 and 4 as short plays in which one child portrays Andrew and another portrays Mike. As a substitute for the box, the children could sit under a table. For the situation shown in Cartoon 3, a third child should execute the "steps" in the hall; for that shown in Cartoon 4, another child should take the part of "Mom."

Use the question sheets for the cartoons, as before.

QUESTIONS FOR CARTOON 3

Circle 0 if you think the statement is an <u>observation</u>; circle 1 if you think it is an <u>inference</u>.

I hear a noise.	0	1
I hear clomp, clomp.	0	1
It must be Dad.	0	1
It could be the mailman.	0	1

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

QUESTIONS FOR CARTOON 4

Circle 0 if you think the statement is an observation; circle 1 if you think it is an inference.

I hear Mom's voice.	0	1
Mom is singing.	0	1
It sounds louder.	0	1
She must be getting closer.	0	1
Mom must be singing louder.	0	1

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

ACTIVITY 4

Use cartoons 5 and 6 to give the children practice in making inferences. When they read each cartoon, they will discover that most of the statements are observations. These are summarized on the question sheet. Have them again mark the senses the cartoon characters used in making the observations. Then tell the children that each of them is to imagine that he is one of the boys in the cartoons and to write one or more inferences the boy might make in the space at the bottom of the question sheet.

For each cartoon, discuss the children's inferences.

QUESTIONS FOR CARTOON 5

Summary of observations:

Look at the pile of dirt.
Here's a hole.
I can put my foot in the hole.
I see the bottom of the hole.
I heard Mother say she needed more dirt for her plants.

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

Write one or more inferences you might make if you were Andrew or Mike in this situation.

(Note: As before, the suggestions in parentheses are for you and are not on the question sheet.)

(The pile of dirt came from the hole.)
(A man dug the hole.)
(Mother dug the hole.)
(An animal dug the hole.)

QUESTIONS FOR CARTOON 6

Summary of observations:

I'm hot.
It's hot today.
We're sitting in the sunshine.
Dad's wheelbarrow is hot.
The slide is in the shade.

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

Imagine that you are Mike or Andrew and write one or more inferences you might make in the situation given.

(The slide is not hot.)
(The grass under the tree would feel cool.)
(Mike was sorry he touched the wheelbarrow.)

GENERALIZING EXPERIENCE

Try to make the children aware that throughout the day, in school and at home, they continually make observations and inferences. To do this, interject the words observing and inferring in casual conversation and use questions such as these: What did you observe? Or, What do you infer?

See Back Cover for APPRAISAL AND COMPETENCY MEASURE

QUESTION SHEET, CARTOONS 1 - 6

QUESTIONS FOR CARTOON 1

Which of the following statements are observations? Which are inferences? Circle 0 if you think the statement is an observation; circle 1 if you think it is an inference.

The ground is wet.	0	1
The tricycle has water drops on it.	0	1
It rained while we were sleeping.	0	1
Mother watered the lawn.	0	1

Which senses did Andrew and Mike use to make the observations?

_____

What would you do to find out which boy is right in the inference he made?_____

QUESTIONS FOR CARTOON 2

Which statements are observations? Which are inferences? Circle 0 if you think the statement is an observation; circle 1 if you think the statement is an inference.

The tricycle felt wet.	0	1
Now it is dry.	0	1
The water evaporated. It went into the air.	0	1
Mother dried the tricycle.	0	1

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

QUESTIONS FOR CARTOON 3

Circle 0 if you think the statement is an observation; circle 1 if you think it is an inference.

I hear a noise.	0	1
I hear clomp, clomp.	0	1
It must be Dad.	0	1
It could be the mailman.	0	1

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

QUESTIONS FOR CARTOON 4

Circle 0 if you think the statement is an observation; circle 1 if you think it is an inference.

I hear Mom's voice.	0	1
Mom is singing.	0	1
It sounds louder.	0	1
She must be getting closer.	0	1
Mom must be singing louder.	0	1

What kinds of observations were made? Circle the senses used; seeing, smelling, feeling, hearing, tasting.

QUESTIONS FOR CARTOON 5

Summary of observations:

Look at the pile of dirt.
Here's a hole.
I can put my foot in the hole.
I see the bottom of the hole.
I heard Mother say she needed more dirt for her plants.

What kinds of observations were made? Circle the senses used: seeing, smelling, feeling, hearing, tasting.

Write one or more inferences you might make if you were Andrew or Mike in this situation._____

_____

QUESTIONS FOR CARTOON 6

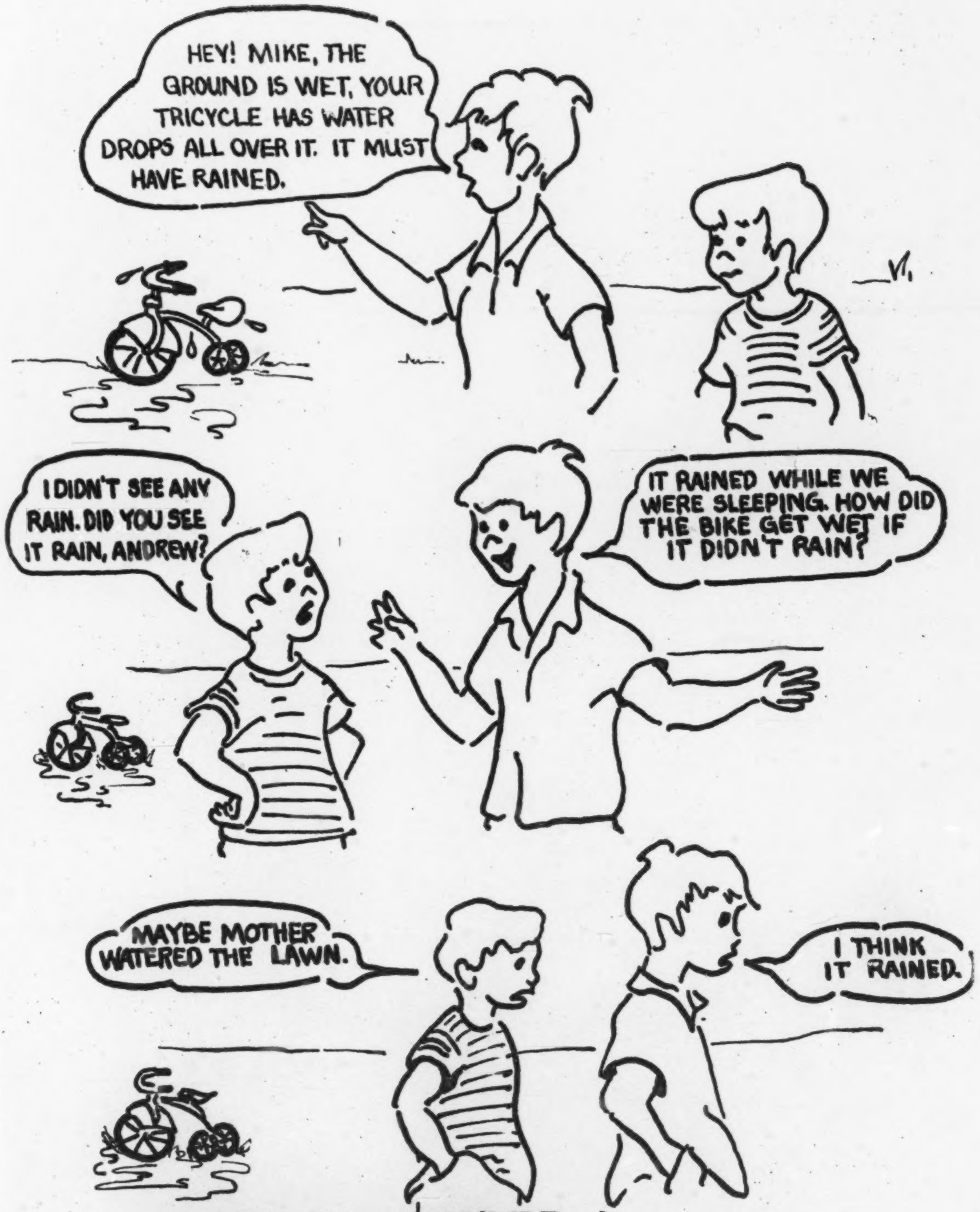
Summary of observations:

I'm hot.
It's hot today.
We're sitting in the sunshine.
Dad's wheelbarrow is hot.
The slide is in the shade.

What kinds of observations were made? Circle senses used: seeing, smelling, feeling, hearing, tasting.

Imagine that you are Mike or Andrew and write one or more inferences you might make in the situation given._____

_____


HEY! MIKE, THE GROUND IS WET, YOUR TRICYCLE HAS WATER DROPS ALL OVER IT. IT MUST HAVE RAINED.
IT RAINED WHILE WE WERE SLEEPING. HOW DID THE BIKE GET WET IF IT DIDN'T RAIN?
I DIDN'T SEE ANY RAIN. DID YOU SEE IT RAIN, ANDREW?
I THINK IT RAINED.
MAYBE MOTHER WATERED THE LAWN.

CARTOON NUMBER 1

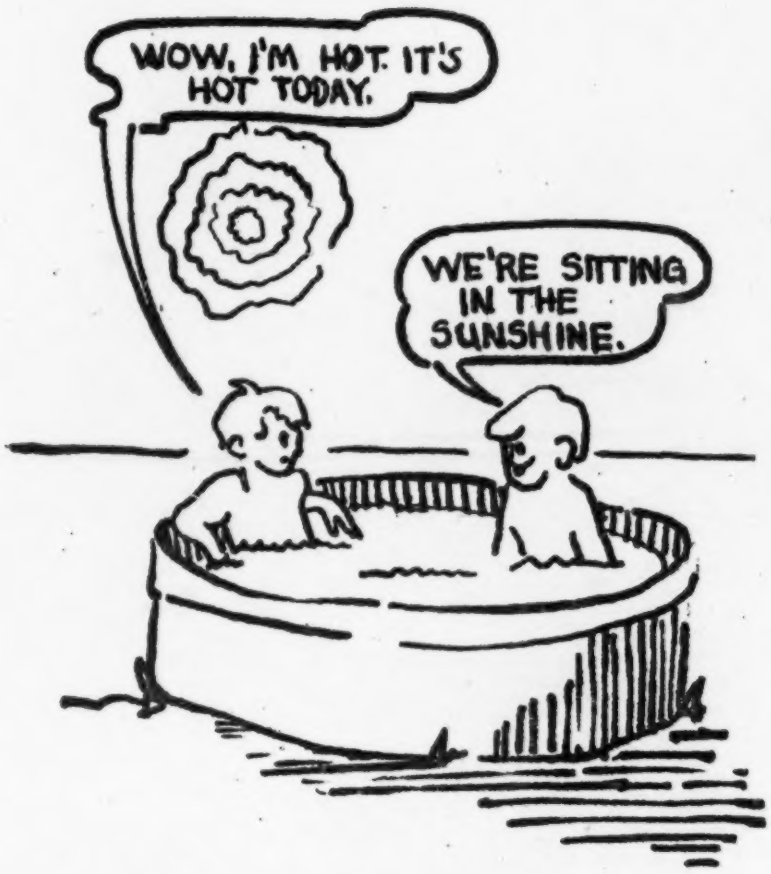
39

CARTOON NUMBER 2

CARTOON NUMBER 3

CARTOON NUMBER 4

CARTOON NUMBER 5



CARTOON NUMBER 6

Appendix C

Instructions and Testing Material
Administered to Students and Teachers

INSTRUCTIONS TO TEACHER

After you have completed the science unit (in approximately 30 minutes):

1. Distribute a packet to each student

   A. Instruct the student to begin answering each test

   B. Have the student write his/her name on each test

   C. Open door to classroom after you have distributed packets

   D. If the student has any questions, instruct him/her to go into the hall and ask one of the proctors

   E. Have the student return the completed tests to the packet and return to you

2. Complete the tests assigned to you

3. Return your test and the students packets to Room 140

Name_____

INSTRUCTIONS

Attached are copies of the same test the students are taking. What we would like you to do is fill out the tests as you think the indicated students would.

For Part I, simply circle the answer you think the student circled. That is, if you think the student responded to question one by saying it was an inference - you would circle the word inference.

For Part II, if you think the student was able to write a correct inference, write the word correct in the space provided for the student to write his answer. If you felt the student in question would not be able to write a correct inference, write the word incorrect in the space provided.

Name_____

INSTRUCTIONS
Part I

Circle the appropriate answer to each of the following questions:

1. Look at cartoon number seven. If you said, "It's raining," you would be making an: INFERENCE OBSERVATION

2. Look at cartoon number seven again. If you said, "There are clouds in the sky," you would be making an: INFERENCE OBSERVATION

3. Look at cartoon number seven again. If you said, "I can't see the sun," you would be making an: INFERENCE OBSERVATION

4. Look at cartoon number seven again. If you said, "The sun is shining above the clouds," you would be making an: INFERENCE OBSERVATION

5. Look at cartoon number seven again. If you said, "The sun is some place else today," you would be making an: INFERENCE OBSERVATION

INSTRUCTIONS
Part II

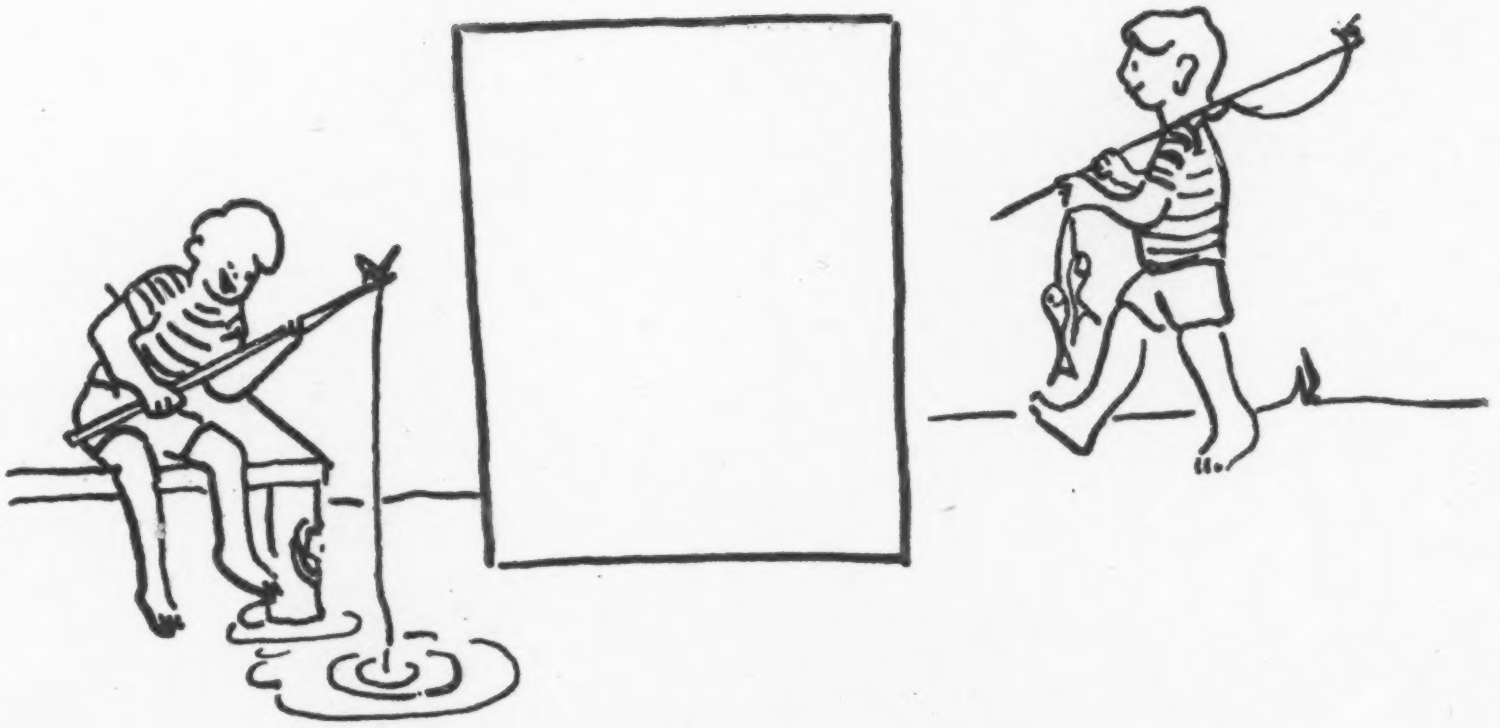
Look at cartoon number eight. The two pictures in cartoon eight tell a story. You will be asked to write about the part of the story that is not revealed in the two pictures.

6. Look at the first picture. Write one inference in the space provided below that you might make to explain why the boy's fishing line is stretched tight.

7. There is a space between the two pictures. If another picture were drawn in that space, briefly describe what you infer it would show in the space provided below.

8. Look at the last picture. In the space provided below, write two more inferences you might make from it.

CARTOON NUMBER 7



CARTOON NUMBER 8

Appendix D

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in Nonverbal Communication

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